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ORGANIC GARDENING

EMMAUS, PA.

Vol. 3, No. 6, Nov., 1943 $3.00 a year 25c a copy

J. I. Rodale, Editor Sir Albert Howard, C.I.E., M.A., Associate Editor

With The Editor

WHAT I am going to describe here is of extreme importance to chicken raisers. However, it will also be found to be of much interest to all other readers because it deals with the role that bacteria plays in the soil.

A few years ago I became interested in earthworm culture. Dr. Oliver in his book "Our Friend the Earthworm" described an ingenious method of disposing of chicken droppings. To those who are not familiar with chicken-raising let me say that chickens sleep at night on roosts about three feet or so above the ground. Their droppings (which seem to be plentiful during the night) fall on a board below the roosts. After a while there arises that characteristic chicken-dropping odor, and unless the dropping-boards are cleaned every week the smell gets quite bad. It is a distasteful chore and in some cases falls on the shoulders of the farmer's wife.

In cleaning the dropping boards it is a rare thing to find a 100% job done. Some of the droppings remain. The day after the scraping is done, the boards again become covered. Each day it gets worse until at the end of the week it must be cleaned. Sometimes, due to pressure of other work, the cleaning is overlooked for weeks. But even where the cleaning is accomplished each week, there is practically always a putrid overpowering smell. I recently visited the chicken lofts of a large-scale chicken raiser whose product is considered tops in the community. The sickening odor was enough to almost knock me down.

Now what I have discovered is a natural method that does away with the necessity of cleaning out the roosts. Another advantage of this new system is that there are no odors in the chicken-house and thirdly the chicken-droppings gradually turn to compost so that the by-product of the farmer's labor in chicken raising increases tremendously in value.

Coming back to Dr. Oliver's method, he places a pit under the roosts, wherein he places some earth in which he puts thousands of earthworms. For 100 hens he suggests 50,000 earthworms. In his book he says, "The reader should not be surprised at this seemingly Gargantuan amount. It has

Rodale Press. Executive and Editorial offices, 6th and Minor Sts., Emmaus, Penna. Subscription rates 12 issues for $3.00 ORGANIC GARDENING, published 12 times a year by Rodale Press, 6th and Minor Sts., Emmaus, Penna. Entered as second class mail at the postoffice at Emmaus, Penna., under the act of March 3, 1879. Printed in U.S.A.

been demonstrated that this large number of active earthworms are necessary for the above-described pit. A lesser number cannot perform the expected work efficiently."

About six months ago we started a flock of about 40 laying hens at our farm and used an earthworm pit under the roosts. Feeling that the large number of earthworms suggested by Dr. Oliver was too high, we merely placed some good topsoil in the pit plus about 1000 local earthworms which we dug up ourselves. The Doctor's purpose was not only that the earthworms would consume the chicken droppings and multiply prolifically, but that the pit would be so arranged that the chickens could get at the earthworms at the sides of the pit and consume some of them. In our experiment we were working for one result only, consumption of the droppings by the worms.

After about two weeks, the pit began to smell. As we were breeding earthworms, and had plenty of them, we then placed about 18,000 worms in the pit and since then there has been no odor in the hen-house. For over five months we have not cleaned out the pits and there have been no odors. So far so good, except that the use of earthworms is rather an unusual procedure, expensive, and the average commercial chicken-raiser would probably never accept the idea.

The method that I have discovered came about through our way of handling our steers. Let me explain. As we do not have any fences on our farm, we do not have our steers on pasture but keep them in the barn, with access to an open air, sunny yard. They can go in and out as they please. Steers do not have individual stalls like cows. They wander all over their portion of the barn. The floor is covered with straw. In about two weeks time it is the customary practice to clean out the barn, which consists of a mixture of straw and steer manure. The material so cleaned out of course should be composted.

In the summer of 1942 the labor situation became very acute. We could not find the time to clean out the barn. Upon inquiry I found that it was the custom in many places not to clean out the manure for periods as long as three, four and five months. Instead, new straw is put down whenever the conditions demand, say about once or even twice a week. The steers trample it in. As time goes on the manure begins to rot from the bottom and gradually turns into compost. We followed this system and when it was time to apply compost to our 1943 corn crop, we used this rotted steer manure, first of course, peeling off the top layer which was not rotted. We had a marvelous corn crop.

However, there was a terribly objectionable odor in the barns, because of not cleaning it out, and visitors remarked about it. Cows cannot be kept on this system, but have individual stalls which must be cleaned out daily. Steers, however, are very hardy creatures, and are not subject to the many diseases which plague the cow. (By the way, to the one or two readers who may not know it, steers are bulls who were castrated when young. The same operation in a chicken produces a capon.) I would recommend this method of leaving the manure in the barn, under war condition only.

This year (1943) we had to follow the same system with the steers but we noticed something extremely unusual. There wasn't a sign of an odor in the barn. Even after four months of continuous dropping of manure, all we could smell was a fine, fragrant odor of straw. *That* was something to think about! The only logical answer was that as manure rots, the bacteria multiply more and more. When we cleaned out the steer-barn last year, we evidently didn't clean it out 100%. This was impossible because the concrete is very rough and couldn't be scraped clean. In one section, the floor is of earth, and this must have become thoroughly saturated with the bacteria. When putting the new straw bedding down and the steers began to drop manure, the old rotted manure acted as a bacteria culture, which immediately began to work on the new manure and must have had sufficient power to break it down very quickly.

In making a compost heap, there should never be any odors. If there are, then it is a sign that something is wrong and the heap should be immediately turned. The fact that there were no odors in the barn showed that a regular composting process was taking place.

Now, what has all this to do with chickens! Well, if the old manure could break down the steer droppings quickly without an odor, why couldn't it do the same thing with chicken droppings? We then made a roosting pit under a second flock of about 40 hens, and in it we put about 6 inches of very fine topsoil. We then obtained one wheel-barrow load of very rotted steer manure from the

very bottom of the manure in the barn and spread it over the soil in this pit. The chickens have now been dropping into this pit for six weeks and not a smell yet. I am firmly of the belief that no earthworms are necessary in the pit, so long as there are plenty of bacteria present. It is also necessary to water the pit occasionally, and be sure that it does not become too soggy.

An important angle of this matter is the question of the health of the chickens who have to live in such a putrid atmosphere as well as the health of people who have to eat such chickens and their eggs. I have heard women remark that some chickens they have purchased have smelled of the barn-yard. Recently we killed 6 of the chickens of the first group that roosted over the earthworm pit. Both my family and that of my brother are agreed that this was the most delicious chicken we ever ate. The flesh was of a most delicate texture and marvelously full-flavored. There are two other reasons why this chicken meat was of good quality. First, we had these chickens running on grass during the summer. Secondly we fed them on home grown feeds raised with organic fertilizers, to the entire exclusion of the so-called chemical fertilizers.

In recent years chicken diseases are increasing at an alarming rate. Is it possible that one of the reasons is the putrid odors which chickens absorb in these unhappy chicken houses?

The idea of having a dropping pit under the roosts is not a new one. In modern chicken-raising practice, a dropping pit is recommended in which superphosphate is sprinkled from time to time to soften the odor. Superphosphate, however, is a strong chemical fertilizer which we believe is definitely harmful to the soil.

What I have described as having happened in our steer barn points an interesting lesson in the study of the biologic life of the soil. As we know, the present "accepted" method in agricture measures only the chemical content of the soil, overlooking the bacteria, earthworms, fungi and other living organisms. They look for nitrogen, phosphorous, potash and other such chemicals, not caring whether its source is organic or inorganic, not realizing that a bridge is necessary to act as the means of transferring this food from soil to plant. Without bacteria, earthworms and fungi a natural transference of food does not take place.

As we have shown, the more the manure rots, the more bacteria are present and as the bacteria multiplies in a given area, its ability to break down organic substances increases materially. You can make an interesting experiment. Take two flower pots. In one, place ordinary soil. In the other add to the soil plenty of finished compost. Take some organic substance like, string, threads from a burlap bag, or some medical cotton and bury some in each pot, about two inches below the surface. Water each pot occasionally. After a period of time, say a month or two, you will find the material in the pot which contains compost, in a much greater state of decay than that in the other pot. This is due to the teeming bacteria in the compost.

In some exhausted, infertile types of soil you can bury such material and watch it for years without it disintegrating. When you get your garden or farm fertile by adding compost each year you are fabulously increasing the bacteria population. Then when you plow under corn-stalks or cover crops, they will be promptly broken down and go to work for the next crop, whereas on infertile soils and in soils where chemicals have inhibited bacterial growth, such plowings under will actually interfere with the next crop. This is because the limited amount of bacteria in the soil which are supposed to help the next crop grow, must go to work and try to break down the plowed-under material. That is why some persons secure disappointing results when they grow green manure (cover) crops. It is the biological life in the soil that is important.

Coming back to the dropping pit, the construction may be of wood, brick, cement or hollow tile. Results will pay for it in a short time. Instead of rotted steer or cow manure where this is not available, use finished compost over the soil in the pit. Have a place where you can keep some compost and let it age considerably. When you take some out for the chicken dropping pit, always leave some compost at the bottom. In time you will have compost that is extremely active with bacteria.

J. I. Rodale

Virus Disease In Raspberries

F. C. KING
Levens Hall, West Moreland,
England.

I have been much interested in reading the report of the Conference on Raspberries recently held at East Malling and in the views expressed by other readers of that report. Apparently the interpretation of the picture painted by the officials of this station on the subject of the future of the Raspberry is as follows:

Commercial and private growers alike are dependent upon the ability of plant breeding to produce at regular intervals new varieties to replace those which quickly become unproductive, chiefly through the ravages of disease.

Let us examine the facts and find out if this is really a true picture by looking back over the past forty years and seeing whether the solution of our problem is to be found in the introduction of new varieties, or whether we are chasing a shadow.

A good standard variety of about forty years ago was *Semper Fidelis,* which gave an ample crop of fruit acceptable in flavor to the general public. The plants produced sufficient canes to satisfy the requirements of the grower and there was nothing unusual in a plantation remaining productive for a quarter of a century. Since the days of *Semper Fidelis* we have had no reason to complain of a shortage of new varieties, but we certainly have reason to complain of the short life of these new types. Few growers have succeeded in keeping plantations of new varieties productive for more than a few years and the whole process of planting has to be repeated at very regular intervals. This, to my mind, points either to failure on the part of the plant breeder or the plant grower, but the interpretation of the picture made by the Conference at East Malling clearly fastens all guilt on the grower. We are clearly shown the rise and fall of plantation after plantation of *Semper Fidelis, Baumforth's Seedlings,* etc., ending up with *Norfolk Giant* almost ready for unconditional surrender.

Interest is centred upon the question of a variety which will supersede *Norfolk Giant,* and the picture portrays more than a hint that, owing to circumstances, the grower must do all in his power to keep *Norfolk Giant* in being for a few more years to admit of sufficient stock being raised of a superior new variety which will make growers wonder whatever virtues they saw in *Norfolk Giant.* There is a note of resentment in this picture. The partnership of breeder and grower is not too cordial. The breeder feels that the grower is allowing varieties to run out too quickly and a gap is developing between the discarding of the old and the appearance of the new, which reflects little credit on either partner, and has led the ventilation of the whole subject in public—a serious state of affairs indeed. The breeders—to absolve themselves from any guilt—having filled the canvas with a remarkable array of new varieties, have also hinted that, in spite of the fact that the grower has the valuable assistance of the manufacturers of artificial fertilizers and a host of inspectors to certify potential planting stocks as good, bad or indifferent, they are called upon to carry the unjustly heavy burden of raising new varieties at a rate which is becoming increasingly difficult.

Let us take a look into the future. Let us substitute *Norfolk Giant* for *Semper Fidelis* and start for another forty years. What assurance have we that the difficulties of the last forty years have been overcome, or that the efforts of breeders or growers will be rewarded by the evolution of a variety combining long life with high cropping qualities? Few people would venture to predict that amongst the mass of unknown and unnamed seedlings one will emerge to fill all requirements. The next forty years are more likely to

be a repetition of the last forty, unless we learn our lesson aright.

In the minds of a few pioneers the breakdown has been located and successful methods adopted, and further in the minds of a large body of growers a faint light is appearing. Despair is giving way to hope, and hope if followed will lead to certainty. The guiding light is there for all to see, shining through the dark clouds of disease and decline, and furthermore the light has never been dimmed, nor as long as the world remains will it shine less brightly for it is truly eternal. THAT LIGHT IS HUMUS. There is no substitute, and unless we retrace our steps and rid our land of all traces of rock and sulphuric acid combinations (superphosphate), sold in bags at so much per hundredweight and scattered on the surface of the land as plant food, we have no alternative but to rely on the plant breeder and in the end admit defeat.

I shall be happy to furnish proof of this assertion in the latter part of this article by giving details of the reaction of the variety, *Lloyd George*, canes of which I planted more than ten years ago and which, at the time of planting, were so riddled with virus disease that the grower was only too pleased to give them away. They have recently been inspected by a representative of the Ministry of Agriculture and Fisheries and pronounced 100 per cent healthy.

To return to the subject of the running out of different varieties of Raspberries during the last forty years, unfortunately I cannot supply records covering the whole period, but I am in a position to give the results obtained on a plantation of *Lloyd George*, the canes of which, as previously stated, were, when planted some twelve years ago, stunted and altogether in a most unhealthy condition through virus disease, and I am able to show the influence exerted upon the crop yield for the past ten years of good cultivation and the application of compost.

At about that time *Lloyd George* was showing unmistakeable signs of degeneration and growers were awaiting the introduction of a new variety. In due course this variety appeared under the name of *Norfolk Giant*, but apparently its run of success is in question and the time has again arrived when growers are at the crossroads or, more correctly, at their wits' end to know what to do. Obviously future plantations of *Norfolk Giant* are out of the question as experience has shown that the first sign of failure in any variety is followed by speedy degeneration.

I chose that moment to plant *Lloyd George*—a moment when it was being discarded in favor of *Norfolk Giant*—and was determined to satisfy myself as to whether the cause of the failure was to be found in failing vigor on the part of the variety, or to a wrong system of cultivation.

I am satisfied that *Lloyd George* is constitutionally sound and that where any evidence appears to support the idea that it is a worn-out discard, the cultivation has been unsound. Judging by the appearance of my canes at the present moment, I see no reason why those canes should not retain their recently won health and vigor for many years to come. I might mention that, as a variety suitable for this part of the country, I do not consider it equal to *Baunforth's Seedling*, because a large percentage of its fruit ripens too late to be of much use. Raspberries in September are possible in Westmoreland, but early August is late enough to ensure good fruit, and the ideal variety for this part of the country would be one producing ripe fruit early in July and finishing by the end of that month. *Lloyd George* is too prone to give a flush of fruit in early July, a second towards the end of the month, with a later batch trying to ripen in September. In 1942 and 1943 my last picking of sound fruit was on August 4th, but each year upwards of 100 lbs. of fruit has spoilt during August and September on account of the weather.

Below I give the yield obtained from 100 yards of canes during the past ten years:—

1934	115 lb.
1935	128 lb.
1936	273 lb.
1937	238 lb.
1938	153 lb.
1939	137 lb.
1940	107 lb.
1941	118 lb.
1942	249 lb.
1943	214 lb.

As will be seen above, the year 1936 shows the highest yield, with 1937 slightly lower, and it was not until 1942 that I passed the 200 lb. mark again. During the autumn of 1936 I commenced alterations in the pleasure grounds of Levens Hall which kept the small staff fully employed, and in consequence the Raspberries were neither cultivated nor mulched until the autumn of 1940.

During May 1939 I answered the Government's appeal to re-

join the Forces and was discharged on medical grounds a year later. I decided to become personally responsible for the care and cultivation of the Raspberries. In the autumn of 1940 I cut out all the old fruiting canes, tied in the new canes and generally cleaned up the plot of weeds. The rows were mulched with compost and the space between the rows forked up. Early in April another mulching was given and the space between the rows forked again. A very slight increase in crop resulted. This has been repeated each year and has resulted in a heavier yield of fruit—much heavier, in fact, than my figures show, as a good proportion of the crop each season could not be gathered on account of bad weather conditions. Rain fell on twenty-nine days during August last, which is much above the average even for the Lake District.

I believe my modest test has clearly proved that a return to the use of compost must be made, if we are to retain the good cropping qualities of our stocks of Raspberries over a reasonable period of time, and that the Minister of Labor might look with profit amongst the country's plant raisers for recruits for work of national importance rather than deplete still further the rank and file of cultivators.

Hints For The Victory Gardener

This is the twelfth of a series of articles by this author dealing with the cultivation of ordinary vegetables

By Roger W. Smith

CELERY

NO selection of vegetables gathered from your Victory garden is complete without the finishing touches given it by a few crisp stalks of celery. The growing of celery is often believed difficult. This is not especially so if a few simple precautions are taken.

Before you start, it is advisable to get some idea of the conditions under which the ancestors of modern cultivated celery thrived. Wild celery still flourishes in the marshes of Western Europe and Northern Africa. These marshes are usually brackish and underlain with limestone or calcareous soil. Some drainage is generally supplied by the close association of the marsh with a river or the action of tidal waters.

Wild celery is a rather bitter flavored, aromatic herb. The cultivated plant has retained much of the aroma but has to some extent been bred away from the marshes. In this connection it is interesting to note that the ancient Greeks named celery "selinon" and considered it a lowland plant. They associated it with "petro-selinon", rock celery, known to us as parsley.

Tests have shown that ordinary celery grows better if excessive soil acidity is corrected by the use of lime, and that it will tolerate a certain amount of alkalinity. It has also been demonstrated that celery plants will tolerate salt to such an extent that the growing stalks may be caused to absorb enough salt to give them a pleasant and definitely salty flavor without apparent damage to the plant.

You will find it best to grow your own plants. One packet of good seed should produce as many plants as you can use and probably leave some surplus. This surplus has excellent swapping value with your neighboring gardeners. Celery plants are not always readily available.

About the end of February or the beginning of March, celery seed should be sown in a flat or small wooden tray indoors. This flat should be about three

quarters filled with a finely sifted mixture consisting of two-thirds mature compost humus and one-third clean washed sand, and have good drainage. Upon the surface of this mixture the seed should be placed one-half inch apart in evenly spaced rows also one-half inch apart. The seed should then be evenly covered with a careful sprinkling of washed sand and firmed. The sprinkling of sand is very important as you will later discover.

The flat should be bottom watered by being placed in a bathtub or similar container in which has already been placed enough water to reach half way up the sides of the tray. It should remain there until the layer of surface sand becomes damp.

Before two weeks are up the seedlings should appear and during that time the surface of the flat should not be allowed to dry out. During this period also, as you have guessed, the problem consists of keeping the sanded surface of the flat moist without causing "damping off" and the loss of the seedlings. However, if you use clean surface sand, good drainage, keep the flat in an airy sunny place, and do not allow it to become soggy from excess water, the seedlings should thrive.

Additional flats should be prepared so that when the young plants are a month old they may be moved to roomier quarters where they may stand two inches apart in each direction. Four weeks later they should be ready to move to the garden but they should not be set out until all danger of long, cold spells of rainy weather is over.

At least a week before the setting out of the young plants the ground should be properly prepared to permit the settling of the soil. This necessity for the settling of the pulverized soil is worth noting. Along the line where the row is to stand, it is best to place a five-inch layer of mature compost humus (well rotted manure may be used if organic composted material is not available). This should be covered with a heavy coating of hydrated lime, followed by a heavy layer of hardwood ashes, if these are available. Hardwood ashes are really important as you will later find.

This mixture should then be deeply dug in and the soil well pulverized to a depth of at least fourteen inches. If you prepare the soil during very dry weather it is advisable to follow the digging by a thorough drenching. In any event the soil should be supplied with sufficient water to penetrate several inches a couple of days before the setting out of the plants.

Moisture is essential for you will remember that celery is a gross feeder. For best results its steady and quick growth is necessary. But if the supply of compost material is low, poultry, stable, or sheep manure comes in handy provided it is well incorporated in the soil before the setting out of the plants.

The plants should be set out in the garden six inches apart in rows twenty-eight inches apart. Care should be taken to see that they are not set deeper than that which they stood in the flat in which they grew. They should be well watered during and immediately following transplanting.

When you come to the matter of the cultivation of celery you will again find yourself faced with the problem of seeing that sufficient moisture is supplied at all times to prevent the drying out of the soil. Anything which approaches the condition which causes the wilting of the plants should be avoided. On the other hand, the moisture should not be so excessive as to encourage mildew and plant disease. Of course, weeds must be kept down. A great aid in the maintaining a reservoir of moisture around the roots, at the same time limiting weedy growth, is the use of a heavy mulch of compost material placed along the rows. And if you add to this mulch a generous supply of unleached hardwood ashes healthy plant growth will be much encouraged.

Hardwood ashes have value because they supply much needed potash without adding nitrogen. Two very destructive diseases of celery, Blackheart and Pinkrot, are probably traceable to the use of excessive quantities of inorganic nitrogen. Many disastrous failures of celery crops have been found upon investigation to have been brought about by the use of excessive quantities of water saturated with chemical fertilizers and applied shortly before the plants matured. Celery plants are easily damaged by excess nitrogen but demand much potash, hence the unleached wood ashes. Ten pounds of unleached hardwood ashes contains the same amount of potash as ten pounds of commercial inorganic fertilizer without the other very undesirable elements.

Many diseases of celery, notably the blights, are no doubt largely due to poor environment. If your garden site has been chosen with decent regard to air and water drainage, these should bother you

little; and if you use properly composted humus, your plants should be immune to plant-fungus diseases. These do their greatest damage in damp, undrained, poorly ventilated areas.

Some very good gardeners believe that green-stalked celery has finer flavor and greater nutritive value than the crisp, bleached type. Just the same, when the plants are about two-thirds mature you will want to bleach a number of them.

This is easily done by using boards. These boards, about ten or twelve inches wide, should be placed on edge alongside the rows and held in place by short stakes driven into the ground. Care should be taken to permit the tufts of the leaves to protrude so as not to suffocate the plants. Lacking boards, you will find that a handy scheme is to tie each plant loosely and then wrap it with several layers of old newspapers, securing these wrappings with pins or string and permitting the leaves to protrude.

After ten or twelve days the boards, or other bleaching materials, should be removed and the plants harvested.

The arrival of cool Fall weather will cause you to think about storage, for you will want to store a number of fine plants for use later on. A very easy way to do this is to dig a trench fourteen inches wide and of sufficient depth so that the plants, when placed in it, will have only their tops exposed a couple of inches above garden level. In this trench the plants, which have been dug and cut with a sizeable portion of their roots left on, should be stood closely together. Any unused portion of the trench should be filled in and firmed.

With the advent of colder weather the boards which were used for bleaching the stalks may be placed over the trench to form an inverted V-shaped roof. This covering may still later be augmented by straw, dry weeds, topsoil, etc.

Under this covering the stalks will continue to bleach and when around Thanksgiving, or even Christmas, you bring into the house a few cool celery plants to add their fresh aroma to a basket of stored vegetables, you will have the gratification of knowing that you have done your humble share in the production of necessary and essential nutrition—a truly patriotic duty.

Our Corn Crop

By J. I. Rodale

WHEN we moved on to our farm about three years ago, we inherited part of a crib of something which looked like corn, but it was about the worst bunch of this grain we had ever seen. It was diseased, misshapen and contained mostly small cobs. The farm contains two cribs. One crib represented the share of corn taken by the farmer, who was a tenant, and the other one represented the share of the owner, which we inherited. This was about a half of a cribfull and was supposed to represent the output of about 20 acres of corn.

In our first year on the farm we had not yet become aware of the organic method of farming and we put in 21 acres of corn, using some manure and some chemical fertilizers. We obtained a crop which filled both corn cribs and overflowed somewhat into another place. The next year we reduced our corn acreage from 21 to about 14 acres and used compost. We obtained a yield of the same quantity as the last year; namely, the two corn cribs full plus the overflow while the quality of the corn was a great deal better than the previous year.

This spring, which represented our third planting of corn, we reduced our corn acreage to only 9 acres. We are now in the process of putting the corn into the crib and considering the number of rows that we have already husked, the results show that with only 9 acres, we have obtained only a little bit less corn than last year of 14 and the previous year of 21 acres; namely, two full corn cribs. (Without the overflow).

Not only did we get such a fine yield, but the quality of our corn this year is by far better than last year and is considerably better than our first year. Practically all signs of disease, which usually show in the tip of the corn, are absent. This has been a bad year for corn in this part of the country on account of lack of rain. Our corn is far superior in quality to the average grown around here. I know that within another year or two, our corn crops will be completely disease-free.

In order to fully understand these results, I want to explain

that the method that we have followed in fertilizing our 63 acre farm is to take all our compost and use it only in the corn crop. After the corn is grown, there is a sufficient residue of organic material from the compost to take the rest of the crops in rotation, such as wheat, oats, and barley. We have had for the last two years a herd of 20 steers, the manure from which we made compost. Now as we kept reducing our corn acreage, we used all of the compost in a smaller amount of acreage. This is giving more compost per acre, which I believe accounts for the increased yield. In other words, because of this method we were able not only to get a finer quality of corn but with less labor because we have had to hoe the weeds out of only 9 acres instead of 21 and it takes less labor to get the corn from 9 acres than if it is spread over 21 acres. This is a partial answer to some of the farmers who say that the use of composts is not practical because it takes too much labor. The farmer might be better off to farm less acreage each year and leave one half of his farm fallow, or grow on such land certain cover crops that would benefit the soil.

Can Our Soil Live Again?

From HOME AND COUNTRY, Official organ of the Federation of Women's Institutes — Natal, Zululand, East Griqualand and Pondoland. April, 1943

IN the early days of children's camping in this land, a woman, whom we will call Nokomis, set herself to learn the art of running a camp. She soon realized that the most thorny problem was not wood or water, but sanitation, and when the numbers of the campers ran to nearly a hundred, it was no easy matter to arrange for perfectly clean, odourless and fly-proof closets.

The problem was solved, but, in the course of dozens of camps up and down the land, the *waste* of so much labour was borne in upon her, and when she heard of other, real business camps, such as for purposes of war, this same waste still worried her.

In China, so she read, the thrifty peasants make use of all the human wastage for their gardens. They treat it in their own way, not too successfully always, as far as smell goes, but their land goes on generation after generation, always fertile, always bearing food. It does not peter out in desert like so much in Africa, the shores of Southern Europe, and America.

Our camper, now too old for such activities, still mourned in her heart the arrangement of Nature by which such an everlasting mess went for nothing. Advanced cities poured it all into the sea, if possible, or tipped it onto extremely smelly sewerage farms.

Then, in the thirties, it became evident that agricultural scientists were bending their intelligence to this same question. Pioneering work was done in India, and the results made known. To the honor of South Africa, some of our enterprising younger men also saw the possibilities of turning human excreta into *food for our sadly starved soil.* The town of Ficksburg in the O. F. S. allowed such a scheme to be put into operation in 1939.

A most interesting article on this vital subject has appeared in *Public Health* (January, 1943), written by J. P. J. van Vuren, the officer in charge of the scheme. He writes: "Since the inauguration of the plant two years ago it has already been proved that although erected a few hundred yards away from the outskirts of the town no unpleasantness whatsoever has been caused to the inhabitants living in the immediate vicinity." A careful explanation is given as to the proper treatment of the night soil, and its conversion into compost, which can then be

sold and put back into the land. It is shown how, by the scientific yet simple treatment, *the heat created in the pit kills all disease germs*, so that this danger is entirely averted.

"A serious appeal is made to all Municipalities and manufacturers to keep the cost of production as low as possible, in order to make compost available for agricultural purposes as cheap as possible," so writes Mr. van Vuren. Now, what, you say, has this business of converting night soil into compost to do with women? As in most other matters to do with Health, it is our concern for many reasons. Do we not yet see that a terrible thing is happening to our land? Unless the starvation of our soil is stopped, we shall never be able to grow our food. We can perhaps import grain, but how can we import the fresh foods that are vital to our children's well-being?

Now here is a method of getting the animal nourishment that the land must have, if it is to stay alive. Chemical fertilizers are like the medicine which stimulates a failing heart. It beats on for a short time, then suddenly stops for ever. Soil must have its foods. In this mechanical age, there are not animals to provide the absolutely necessary dung—there are only humans, but plenty of them.

The first thing we women can do about it is to remove the finicking prejudice which may influence public opinion against a scheme for our dorp like that of Ficksburg. We need to get the same sensible attitude about sterous as that held by hospital nurses, who are the cleanest body of people on the face of the earth.

We need to get the wind up —to the extent of a perfect gale —about the way our gardens, our farms, our Native reserves are refusing to bear any more, and agitate till something far more drastic is done to nourish them back into fertility.

This modern use of night soil is one reasonable method, and we can see that our own dorp does not throw away such valuable life.

For the secret of the good earth has been found by wise and patient scientists that *what it gives must be put back into it.* The old yellow Chinaman, in his wisdom, has known this since something B. C. but, late though we are, we can now humbly see our own failure, and determine to deprive the soil no more.

Let us ventilate the subject, make up our minds to learn from Ficksburg (where they have even found improved methods of collecting the night soil) and seize this opportunity of getting what we so sorely need for our gardens.

Coastal Fertilizers

By Louis Livingston
Osprey, Florida.

I live by the sea on a ridge six hundred feet wide, the Gulf of Mexico on one side of me, Little Sarasota Bay on the other. People from the mainland admit it is a nice key but are apt to temper their approval with the objection: "But you can't grow anything there."

True, I couldn't. Of course the native growth flourishes. Sabal palmettos, myrtle, seagrape like it here. Calcareous soil suits them fine. But when it comes to trees and shrubs that need rich earth, and to vegetables, I have found out for myself that you can just keep them going, you cannot make them healthy, even with plenty of artificial fertilizers. Even animal manure used by itself never seemed to make the soil right.

When I was lucky enough to become a subscriber of "Organic Gardening," in January 1943, I thought perhaps I had found the answer. But I couldn't be sure. It sounded too good to be true, this Indore method of composting. Anyhow, I lived in a good spot to test it out, with many kinds of compost material either right at hand or near at hand. The key being sparsely settled. weeds and wild grasses cover acres, while chicken manure may be had for the taking at a poultry farmer's across the bay. And I take plenty, in my station wagon, on nearly every trip to the neighboring store.

The complaint, "You can't growing anything there," was based on the fact that sand and shell permeate my soil. Indore composting has changed all that. It has made quite a change in my life, too. It has given me a new interest, an absorbing hobby. Composting

is good for the soil, but take it from an enthusiastic old man, it is also good for the soul. The labor of turning a compost pile would be boring to a degree if one were paid to do it, but it is truly a labor of love to a person building up his own land.

I get enormous satisfaction out of saying to a visitor: "Come and see my papayas and my citrus," and watching him open his eyes in surprise, and then asking him if he has ever seen a deeper or more beautiful green and having him answer, "No, I never have." I have had that delightful experience with a professional nurseryman!

I showed this nurseryman my shrubbery, all of it in wonderful shape, including tender hybiscus, ixora, coral bougainvillia, then said to him, "Come back here and see what does it!"

I pointed out a pile ready for use, and though professional horticulturists, like any other professionals, do not relish lessons from amateurs, a close examination of the rich flaky humus by my visitor in this case—who buys his inorganics by the truckload and whose own incidental composts stand by weathering for two years—impressed him more, I think, than he cared to admit.

My soil being so extremely alkaline and my locality so replete in organic matter, I use considerable material directly on the land. Take seaweed. Seaweed is wonderful. We get occasional invasions of seaweed during the summer and I no longer add it to my composts but conserve its organic values and its wealth of potash by digging it under direct, thus avoiding loss through leaching and adding an extra punch to the compost humus which joins it later. To console the compost piles for denying them seaweed off the open beach I substitute nice oozy slimy stuff collected along the shore of the bay at low tide.

Another valuable material I like to use direct is rotted oak leaves, and I mean rotted. It takes, as we have all learned, many years for oak leaves to disintegrate. From a dry pile they hold their shape almost indefinitely, but where I get my supply, and I can also have this for the taking, the mass is black soil when I get it and blue black when dry, with only here and there the hint of leaf form remaining.

This precious element comes from a lovely old estate across the bay where the fallen leaves of endless massive live oaks created a problem even to the grandmother of the present owners and back in her day hired-men deposited wagon loads of leaves in a low spot in the woods where they have lain partly submerged, at least during the rainy season, ever since. By now this luscious stuff is worth its weight in gold, but nobody seems to realize the fact except I, and I only through the teachings of "Organic Gardening."

Since chicken manure supplies all the ammonia a compost needs, the oak residue is superfluous there, but glorious under a garden plot or flower bed, or as mulch.

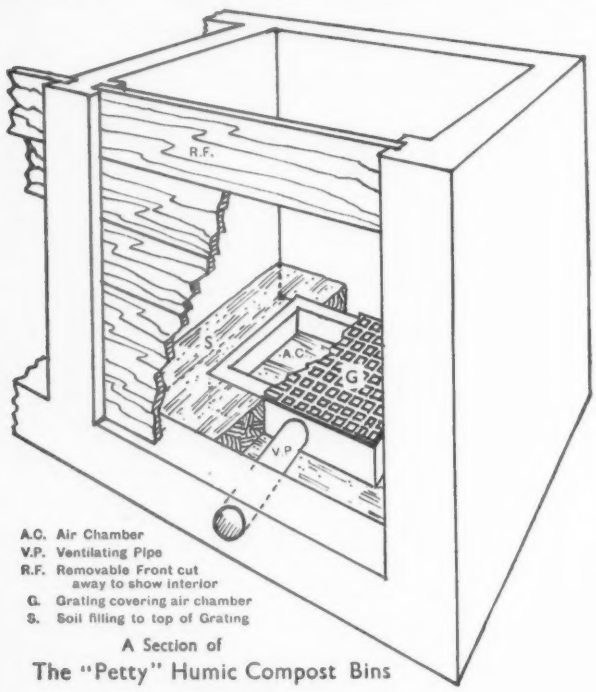
Speaking of chicken manure, it is twice as rich as cow manure, but we have a material going to waste in this area which is something like fifteen times as rich as chicken manure. I mean g u a n o. Our herons, cormorants, pelicans, gulls and terns could give us nearly the same fertilizer values that farmers formerly got from the famous Peruvian guano. For we have dry spells that often last for months and the loss of nitrogen through moisture would be neglible. Provide the birds with platforms and they would gratefully do the rest. I hope to get around to it some day.

Intelligent composting not only turns infertile land to fertile, but it promotes a corollary interest in the use of individual materials, most satisfactorily sometimes, as in my case with seaweeds and oak leaves, but occasionally there pops up a baffling problem. My current problem is fish. Dead fish in the compost piles put me hopelessly on the defensive and I had to desist.

Now I must bury my fish, deeply, and quickly. But, that way, it takes too long to decompose. A five-foot shark under my new vegetable garden is holding me up now. That's the trouble—the best of hobbies can't be all beer and skittles.

The 'Petty' Humic Compost Bins

The following is a bulletin issued by the New Zealand Compost Club.



A.C. Air Chamber
V.P. Ventilating Pipe
R.F. Removable Front cut away to show interior
G. Grating covering air chamber
S. Soil filling to top of Grating

A Section of
The "Petty" Humic Compost Bins

CONSTRUCTION NOTES

The Site.—Choose a site where partial shade is available—such as near a deciduous tree which provides shade in Summer and allows the sun's rays to come through during the cold Winter months. The bins should be sheltered from strong winds.

Material.—The bins can be made practically of any material, but where durability is desired good heart timber, concrete or bricks should be used. The bin's consist of four walls only, the bottom being the earth; this is an important factor.

Size.—The bins should be built in pairs alongside each other. A handy size for the average garden is 3 ft. x 3 ft. x 3 ft. 6 in. high.

Ventilation.—This is most important and is provided by a grating made of small mesh wire reinforced with rods of fencing wire. The size of the grating should be three-quarters the area of the bottom. A six inch pipe is let in through one side near the bottom and into the air chamber under the grating.

The movable front, made of wood, is optional, but is very convenient for emptying the bin. This applies also to the division between the bins.

ONE of the chief objects of the Club is to bring to the attention of Home Gardeners, Market Gardeners, Farmers, and other users of the soil, the value of Humus in the growing of all crops and flowers. The making of Humus is greatly accelerated by using the "Petty Process." The method of using is as follows:—

The first layer in the bin should be four to six inches of long grass, hedge cuttings, straw, or any vegetable matter that will let the air through. Then add six inches of lawn cuttings, over which spread one inch of animal manure such as cow, sheep, fowl, etc., followed by one inch of good soil, which completes the first sandwich.

The second sandwich consists of six to eight inches of lawn cuttings, weeds of all kinds, seaweed, house refuse of all kinds except tins and coal ashes. Then add the animal manure and soil as before. This is repeated until the bin is filled.

House refuse may be added at all times. It is preferable that lawn cuttings should be mixed with coarser vegetable

matter such as long grass, straw, etc., to obviate caking.

Bin 1 when filled should be left for one month uncovered, then turned into Bin 2 and left for one month when the contents will be ready for use.

Refill and turn bins as emptied. Bin 2 should be covered during excessive rain as the same moisture is not required as for Bin 1.

During summer months, or dry spells, Bin 1 should have water added, say twice a week, and Bin 2 once a week.

Lime, fish, and unsterilized blood and bone may be added.

A properly constructed heap does not attract flies, nor have an unpleasant odour. Should either be present turn the heap or cover with earth.

EVERYTHING comes from the Soil, and those things of the greatest value to man are nourished in the comparatively thin layer called Humus.

Humus is Nature's Fertilizer, consisting of the decayed animal and vegetable life of countless centuries: teeming, as it is, with microscopic life which prepares this organic matter on which plants thrive.

Fertilizers in general use today are the product of laboratories, lacking the assimilating and mellowing influences of myriads of Nature's workers present in the soil.

The causes of the prevailing diseases of animal and crops, and the poisonous antidotes used to combat them, can upset the balance of Nature, and bring about such disintegration of the soil as ultimately to render it unfit for crops or pastures, as is known to exist in ever-increasing areas.

The greatest heritage one generation can pass on to another is a healthy, life-giving soil. The Humic Compost Club is striving to this end. You can help, with profit to yourself, by joining. The subscription is 5/-, and you will receive literature giving the latest information for treating the soil by Nature's method.

Using the Leaves of October to Make the Ground Fruitful

ROBERT F. CHANDLER Jr.
From The New York Times

IT is common in October to see Autumn leaves being burned. Yet the same persons who burn the leaves purchase peatmoss or farmyard manure for their gardens. If properly managed the leaves of hard-wood trees can be readily used as a source of humus and minerals, cutting down the amount of other materials to be obtained.

Under natural conditions, in the forest, trees secure a large part of their humus and mineral nutrients from the leaves that fall to the ground each year. Upon falling, the leaves are immediately attacked by soil bacteria, fungi, and larger soil organisms such as earthworms, millipedes and sow bugs. They are often so quickly disintegrated and incorporated into the mineral soil that by the time another crop of leaves starts to fall, all of the previous seasons leaves have disappeared. The result is that the soil is well supplied with organic matter and a good friable condition exists.

The amount of leaves deposited in a forest stand is about 3,000 pounds per acre per year. This leaf material also carries a considerable quantity of the most important mineral nutrients that one often purchases in the form of fertilizer. Work conducted at Cornell University has shown that, on the average, hardwood stands each year deposit the following amounts of mineral nutrients:

	Pounds Per Acre.
Nitrogen (NO-3)	73.0
Phosphorus (P)	7.5
Potassium (K-2-O)	16.2
Lime (CaO)	91.8

These calculations are based on the normal leaf fall under forest conditions. The gardener can, however, greatly increase these values by heavier applications of leaves than

would occur under natural conditions.

Now the question arises as to how one is to save this cheap but valuable source of fertilizer. One way is simply to rake the leaves over the flower beds and leave them there over Winter. In the Spring, those that have not been incorporated by natural means can be worked into the soil by hand.

The Compost Pile

Of course one of the best ways to use leaves is to make a compost pile. The main thing is to pile the leaves in a rectangular heap so that rainwater will soak into them. It is usually best to add a layer of soil a few inches thick, once or twice, in building the pile. This helps to prevent the leaves from blowing away, and also has other beneficial results. The compost pile should be forked over a few times during the following Summer, and after it is one year old, it will prove to be a source of well-rotted artificial manure.

If the idea of using the leaves from shade trees does not, at first, appeal to the gardener, he should remember that the peatmoss that he buys is really just decomposed forest tree litter. Also, that the shade tree in his yard may be only one generation removed from a natural forest stand where leaves constituted its chief item of diet.

Will There Be a Black Death?

F. SYKES

Being the latter portion of an article printed in an English Publication.

SIR ALBERT HOWARD wishes me to write a book to record the whole of my experiences and accumulation of details of evidence to support the system of farming which has now been laid down for the land at Chute and which, after much travail, is now working smoothly—and nothing short of a book will suffice to give me the space I need to set out the facts and results in their proper sequence and forcefulness. But in the space of this article he wishes me briefly to set forth my views of the urgent need for the wide application of my system of farming, if this country in particular and the world as a whole are to avoid the major catastrophe that may be lying not very far ahead. This task is by no means easy within the scope of a single article.

Therefore, I will ask myself, what are the major lessons that I have learned after twenty-nine years of farming observation? They are: (1) that the well-being of mankind is interdependent with that of the animal, the plant, and the living soil; (2) that a fertile soil is one rich in humus; (3) that whenever the humus content of the soil is depleted (as in the growing of a wheat crop), the humus must be replaced with more humus manufactured by the mechanism of biological processes, e. g. vegetable growth (as in grass) and its decay when ploughed (accelerated and activated by the micro-organisms of animal dung and urine).

And if the world as a whole adopted these hypotheses, what would be the result? A healthy, robust, and practically disease-free human race, because man —who is healthy according to the food he eats—would live on a healthy diet of wholesome and disease-free milk and animal products, healthy vegetables, wholemeal bread, all grown on soil that was humus-sufficient and disease free.

And if the health of a nation is as simple as all that, why can we not adopt my system of farming to-morrow and in five years have a disease-free world? Because for over a hundred years the world has labored under a sad and pitiful delusion — THAT THE REFERTILIZATION OF LAND IS CHEMICAL AND NOT BIOLOGICAL, and because there have grown up in England and America most powerful vested interests who will not allow the world to be disillusioned.

Then is there no hope for mankind? Yes, there is one hope—DISEASE.

The continued use of artificials on the one hand, which produces food of diminishingly efficient feeding value for both man and beast, is reducing vitality so low that resistance to the malignant bacteria of disease is becoming less. On the side of man's interest, notwithstanding the formation of the Ministry of Health with its myriads of enactments, its inoculations, its housing and its hygiene, with the spending of millions sterling, disease in man still defies the world. The sources of all disease is in the food we eat which comes from the soil. START THERE. Make a healthy, living soil. Grow thereon a healthy plant. Produce a healthy animal, and in turn a healthy man, and the Ministry of Health can be liquidated in a very short time.

The second mistake is the feeding of concentrated cakes and meals—the by-products of the soap and oil industries (which produce more powerful vested interests) to cattle and poultry to stimulate the production of unnatural quantities of meat, milk, eggs and poultry meat. I have cured disease in animals by cutting out the feeding of factory-made concentrates and substituting food like oats, peas and beans, and grass grown on humus-sufficient fertile land on the farm.

Two difficulties present themselves:—

(1) Farmers will not cease to use artificial fertilizers for their land, because they have been taught by clever propaganda over a long time that it is more profitable to use them for crop production than the keeping of and relying upon live stock, and they are averse to the wide use of humus because this involves labor which is unobtainable and costly.

(2) Farmers will continue the use of factory concentrates for their cattle feeding, because again skillful propaganda has driven into their heads that they can produce neither milk nor meat without them. It does not begin to occur to one farmer in a thousand that the prevalence of contagious abortion, tuberculosis and the other ills of their livestock may be brought about by the use of artificials on the land, or the use of the concentrated cakes fed to their cows.

And so DISEASE WILL COME. Come? It is already here everywhere in abundance. There are very few disease-free herds in the country. Foot-and-mouth is periodically rampant; tuberculosis is most dangerously prevalent; mastitis is as common as the dawn of day; Johne's disease and barrenness are rife everywhere. It is estimated on reliable data that 80 per cent of dairy cattle passing through the markets are diseased in one form or another. The milking life of the average dairy cow is now reduced to two and a half years.

Is the Ministry of Agriculture worried? Yes, indeed they are. Remedies? Oh yes, vaccines and veterinary panels. But why not start at the bottom in the soil itself? Hush! No one has ever thought of that. In officialdom you must never go to the root cause of disease—that is a most unprofessional approach.

And so before the nation can have disease-free food—food with good nutritional composition—we must first of all endure the terrible agony of a wide visitation of plague or disease which will make the BLACK DEATH appear like a summer's afternoon picnic in comparison. The disease will become uncontrollable in cattle ere long and through meat and milk will transfer itself to men, women and children. We shall lose millions of live stock and perhaps millions of our human population. And then—what then? For a time doctors will be overworked with inoculations, and more deaths will ensue, and after that someone will arise in the midst of a bewildered community and point to the warnings of Sir Albert Howard and Farmer Sykes, and enquire why their advice was not heeded; and since by that time most of the beneficiaries of the vested interests of both artificials and cattle cakes will have succumbed to the plague—well, a trial, anyway, will be made of my system of farming.

What a pity it is that such an experience appears to be the inevitable and only way to bring a world, which places vested interests before life itself, to any sense of true decency of conduct and sensible action, for only by downright disaster will man repent the error of his ways.

Is it not possible that great men like Dr. Temple, Mr. Churchill, Mr. Roosevelt and General Smuts—and all are agreed these four are really great men—could be induced to investigate this important subject of HUMUS-FERTILE LAND, its bearing on human and cattle disease? Yes, in my opinion it is possible that they could be influenced to take action and order an impartial investigation.

The Union of South Africa is already becoming compost minded and great strides are being made in the faithful adoption of Nature's great law of return. In the United States

the resources of the Rockefeller Trust are available for demonstrating on a large scale the great principle that a fertile soil means h e a l t h y crops, healthy live stock and last, but not least, healthy human beings. There is still time, but not too much time, to establish this great truth before the war ends, so that when peace comes agriculture can take its proper place in the world of to-morrow and the public health system of the future can be based on a soil in good heart.

The real arsenal of democracy is a fertile soil, the fresh produce of which is the birthright of the nations.

The Effect of Agricultural Conditions on the Mineral Contents of Some Farm Crops

GLEN WAKEHAM

Associate Professor of Chemistry—
University of Colorado

IT has been observed (9) that, while proportions of proteins, carbohydrates, and fats found in standard foods are fairly constant, their mineral contents may vary over a wide range. A recent review (1) of this subject lists over six hundred references; yet the variables involved are so numerous and complicated that they often defy observation or control and the reports of different workers are therefore frequently contradictory. Most of the references mentioned are old. Very little recent attention has been given to the subject. An excellent recent review of agri c u l t u r a l chemistry (7) discusses the mineral requirements of plants in considerable detail, but does not mention the mineral food values of crops. The absence of any generally reliable principles has led many agricultural experts to base their judgments upon the actual productive histories of farmlands rather than upon soil analyses.

The importance of vitamins is generally recognized, and much is being done to "fortify" vitamin-deficient foods. It is also well known that widespread weakness and disease are caused by the lack of essential minerals in many popular dietaries. Some attention is being paid to this problem. Most dieticians, however, still labor under the illusion that if they look up the alleged mineral composition of a food in a standard work on nutrition, they may assume that any sample of that food will live up to the data given. Unfortunately, this confidence is unjustified. Some samples of spinach, for example, have been found to

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contain hardly one-tenth as much iron as others. Numerous similar instances might be cited (9). It is impossible to know the mineral content of many standard foods without analyzing the sample in question.

A recent general survey of agricultural research (6) states: "Approximately 95 per cent of the expenditure on agricultural research has been used to increase production; only about five per cent of this money has been spent to discover new uses for agricultural products." Which leaves approximately zero per cent for the improvement of the nutritional quality of the products. This policy has led to the accumulation of embarrassing surpluses of some food-stuffs. Quantity and appearance have been the objectives. The nutritional value of the food has not been considered. It should be worth while to determine how good these products are.

With regard to the mineral contents of crops, it has been rather loosely assumed that if the plants would grow, the soil must be sufficiently mineralized; and that if the essential minerals were present in the soil in sufficient quantities and assimilable forms, the crops would be adequately mineralized, from the viewpoint of nutrition. These assumptions are now known to be invalid in many cases.

It is, of course, impracticable to analyze all samples of food eaten. What we need—if they can be discovered—are a few rough-and-ready rules whereby the mineral contents of any crop can be approximately judged if the agricultural history of the crop is known.

The experiments described herewith — admittedly of a somewhat crude, preliminary nature — were suggested by the "practical" observations of farmers in Boulder County, Colorado. They should be considered as of a local significance only. Any generalizations suggested by them should be tested by further experiments.

"Practical" Observations

Winter-wheat grown on "dry-land," summer-fallowed every other year, commands premium prices from millers. It has been shown to be richer in protein and in mineral content than wheat grown on "rich," heavily fertilized, amply irrigated "bottom" land. This is all the more remarkable as, in many cases, the "dry-land" has been cropped, every other year, for twenty years or more, without the use of any fertilizer, either barn-yard or chemical. "Summer-fallowing" seems to have remarkable restorative powers, although, of course, it cannot renew the mineral content of the land.

Cows pastured on rough, foot-hill country, where the grass is in sparse, intermittent patches, not only give more milk, but the milk is of higher fat-content than when the same cows are pastured in rich, river-bottom meadows.

Horses sent to the "high country" during the summer months come back in the fall in far better condition than those which have been pastured in rich, river-bottom meadows.

Experimental

In the first, preliminary experiment, the chief variables were: type of soil, fertilization, irrigation. This work was done in the hope that it would suggest more accurately controlled further investigations.

Two plots of land were chosen, a few rods apart. Plot "A" was "rich, bottomland," well fertilized with old barn-yard (cow) manure and adequately irrigated with glacial water. ("Glacial" water originates chiefly in the glaciers and high snow-fields of the Front Range — Continental Divide.) Plot "B" was sandy "dryland," on a gentle slope, unirrigated and unfertilized. Both plots had been used for many years to raise various garden products. The "dry-land" crops, on account of dry seasons, had often failed, the land consequently being left fallow.

Samples of the soils were taken to a depth of six inches and analyzed by standard methods (8) (Table I). Garden peas ("Laxtonian") and beans ("S Green Pod") were chosen, as they are known to vary widely in mineral content (9). The plots were carefully ploughed and hand-raked. The peas were planted on April 27, in drills 30 inches apart. The beans were planted on May 10, in drills 18 inches apart. Soon after they came up, the seedlings were thinned out to average distances of about three inches. The plots were kept weed-free throughout the growing period. The rain-fall, from planting to maturity, was 4.7 inches. The "A" plots received, in addition, about seven inches of irrigation water, the "B" plots none. The "B" plots, however, were given extra cultivation according to approved "dry-land" technique for the fullest utilization of whatever natural moisture they received. The peas, growing to a height of five feet, were staked. Both beans and peas, upon blossoming, were sprayed with a commercial suspension of white arsenic.

TABLE I. *Soil analyses (per cent)*

Soil	SiO^2	Al^2O^3	N	Ca	P	Fe	K	Na	Mg
"A"	62.3	14.8	0.141	0.743	0.113	2.05			
"B"	75.6	9.2	0.063	0.651	0.062	1.35			
"C"	71.4	13.7	0.145	0.81	0.12	2.12	1.73	2.55	2.09
"D"	73.2	8.3	0.12	0.77	0.11	1.85	1.51	1.8	1.85

All of the crops were allowed to mature completely. The seeds were harvested and shelled by hand, during the last week of August. Representative samples of the air-dried, ripe seeds were analyzed by standard methods (5). As the experiment was concerned with food-values, no other parts of the plants were examined. The analytical data obtained are given in Table II.

The significant observation seems to be that the "poor" crops, although less than half as abundant in yield, were considerably richer. proportionately, in calcium, phosphorus, and iron than the "rich" crops—this in spite of the fact that the "poor" soil contained less of these elements (Table III). Table IV shows that the average size of the "poor" seeds was less than that of the "rich" seeds. Each pod of the "poor" crops contained two or three normal, well-developed seeds; but the seeds at the ends of the pods were usually stunted.

It was suggested that the amount of watering, natural or artificial, might be the critical factor in mineral absorption. Several workers (2, 3, 4) have reported that increased water supply (by irrigation) increases the absorption of certain minerals, up to an optimum point, above which further increase in watering decreases the mineral contents of the crops. From the viewpoint of Colorado practice the amounts of water used—up to 200 inches—seemed almost fantastic. Hence an experiment was devised within the limits of Colorado practice to see whether variations in water supply—all other factors being controlled—would show any significant effect upon mineral absorption.

The soil in a twenty-foot square level plot was dug out to a depth of about eight-inches. As it was rather heavy with clay, it was "lightened" by mixing thoroughly into it about half a ton of creek-bottom sand. It was fertilized by the addition of about 500 lbs. of well-dried, year-old barnyard (cow) manure.

TABLE II. Food analyses *(per cent)*

Food	N	Ca	P	Fe	Ash	H^2O	K	Na	Mg	Fat extr.	Fiber	N-f extr.
Bean												
"A"....	3.85	0.152	0.431	0.0071	1.48	11.2	0.055	0.0021	0.0091	2.3	3.4	56.9
"B"....	3.97	0.195	0.587	0.0141	1.68	9.1	0.056	0.0020	0.0093	1.7	3.7	56.6
Peas												
"A"....	3.42	0.121	0.383	0.0063	1.37	10.8	0.052	0.0017	0.0097	1.9	2.9	61.2
"B"....	3.71	0.183	0.524	0.0097	1.55	8.4	0.058	0.0016	0.0120	0.9	3.7	60.2
Alfalfa												
"A"....	2.81	1.93	0.21	0.021	9.25	9.3	2.12	0.24	0.31	1.7	26.5	31.2
"B"....	2.95	2.27	0.28	0.023	11.8	6.45	2.35	0.23	0.38	1.4	27.1	30.3
Clover												
"A"....	2.68	1.96	0.23	0.019	10.1	8.45	2.05	0.21	0.28	1.7	28.7	30.7
"B"....	2.88	2.23	0.27	0.024	12.2	5.5	2.40	0.19	0.35	1.3	28.9	30.5
Alfalfa												
"C"....	3.12	2.32	0.33	0.027	13.3	4.85	2.45	0.28	0.41	0.9	28.8	27.8

TABLE III. *Yields, per square rod, of air-dried, ripe seeds*

Beans "A" 5.2 Kg.	Beans "B" 2.3 KG.
Peas "A" 4.9 Kg.	Peas "B" 1.9 K.G.

TABLE IV. *Weights of* 100 *air-dried, ripe seeds of each type*

Beans "A"	33.2 gms.	Beans "B"	27.4 gms.
Peas "A"	21.7 gms.	Peas "B"	16.9 gms.

This uniform soil was spread out evenly on the plot. Table I gives an analysis of this soil ("C").

As the season was late (end of July) the quick-growing crops—alfalfa and white clover —were chosen. Two plots of each were planted. After a couple of initial waterings, to germinate the seeds, one plot of each crop was left unwatered while the other two were sprayed twice a week with about an inch of glacial irrigation water. All of the crops were kept weed-free. On October 7, the "hay" was cut with a forward-blade lawn-mower, set at two inches. The hay was thoroughly sun-dried and each crop weighed separately. The artificially watered crops were labeled "A," the unwatered crops "B." The "A" crops received approximately 18 inches of irrigation water, in addition to 5.7 inches of rain-water; the "B" crops, after two inches of initial spraying, only the 5.7 inches of rain-water. Under the conditions of harvesting, the "A" crops produced 5.5 Kg. of immature, sun-dried alfalfa hay and 4.9 Kg. of clover hay. The "B" crops weighed, respectively, 2.9 Kg. and 2.7 Kg. Table II gives a partial analysis of these crops.

Under the conditions of this experiment, with the crops grown, water-starvation, while it greatly cuts down the yield, does not significantly alter the proportional mineral content of the crop. The percentage of total ash is somewhat increased, that of fat diminished.

A sample of alfalfa ("C") grown at an altitude of 8,000 ft. was examined. It was cut and dried at approximately the same stage of development as samples "A" and "B." The soil ("D") was "poor," sandy, and unirrigated (See Table I). The crop was sparse and stunted. Yet the analysis (Table II) shows that it was relatively rich in essential minerals.

OBSERVATIONS

Crops grown under "poor" conditions may be more adequately mineralized than those grown under "good" conditions.

The proportions of minerals in the soil do not entirely condition the amounts absorbed by the plants.

In some cases, at least, water is not the critical factor in the amount of mineral absorption.

If it is generally true that crops grown on marginal lands, under marginal conditions, are more richly mineralized than those grown on heavily fertilized, adequately watered lands, the fact is of practical importance from the nutritional viewpoint. The hypothesis seems to be worthy of further investigation.

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In response to our query to explain the term "SUMMER FALLOW" Professor Wakeham replied as follows:

Dear Mr. Rodale:

The term "summer fallow" is inaccurately used in this district for the so-called "strip-farming." Alternate strips of dry-land are planted on alternate years. Each strip is cropped only every other year. Nothing is planted during the "fallow" year. There is, of course, some growth from seeds of the regular crop (usually

wheat) and some weed-growth. But the land mostly "rests." There seems to be some gain in soil-nitrates and nitrites, due, possibly, to soil bacteria.

"Dry-land" is land above the irrigation level. It costs only from $25 to $50 an acre, as against $200 to $300 an acre for land with irrigation rights. Dry-land crops often fail, when there is a dry season: but the investment is so low, relatively, that farmers with some capital can hold over, and "clean up" amply in the good years. Winter-wheat nearly always does well in dry-land, as the snow-fall is fairly constant and well distributed. In many cases dry-land — "strip-farmed" — has borne, on alternate years, good crops of wheat for thirty years, without the use of fertilizer of any kind, before the soil began to show signs of mineral exhaustion. While the summer-fallowing can renew the nitrogen, it cannot, of course, replace the minerals. Wheat has low mineral requirements. Crops like alfalfa and clover "wear out" such soil very rapidly in so far as minerals are concerned, although they build up the nitrogen.

"Dry-land farming" is a technique of cultivation which preserves as much of the scanty moisture in the soil as possible. The loose, sandy, "Chernozem" soil is piled up from time to time around the rows of plants. Our average annual water-fall is 12 to 14 inches—this year only 7 inches thus far—whereas you get 40 to 50. This technique, of course, is not applicable to cereal culture.

I shall be interested to hear what you have observed regarding chicken-droppings. This is a live question out here. Chickens which live largely on grass-hoppers—a not uncommon phenomenon out here—are said to produce "poisonous" droppings—I don't know why.

Yours faithfully,
G. Wakeham.

The Use of Compost Produces Results

By Lady Eve Balfour

An excerpt from the book "The Living Soil."
(Faber and Faber, London)

RESULTS of the use of compost are available from all over the world. Here are a few representative examples. Mr. R. Paton of the Morib Plantations Ltd. of Banting in the Federated Malay States, writes:

'We started to keep livestock on a fairly big scale in 1930 for the purpose of manuring our coconuts, and this was done in conjunction with composting of husks, fronds, etc. in trenches two feet deep along the centre of each row.... Our average yield per acre was below nine piculs of copra, and the palms were then beyond the age at which one would expect any appreciable response in yield. Nevertheless, they have yielded over fourteen piculs per acre average for each of the past five years, and look like doing even better. Fine results have been obtained also in our rubber areas, particularly in young replantings, where the growth is all that could be desired, and not one ounce of artificial fertilizer has been used.'

A good example from Europe was to be seen before the war on Dr. Pfeiffer's farm, near Flushing in Holland. He uses the bio-dynamic method of composting, and neither his green-house nor his outdoor crops received any artificial fertilizers. He succeeded in producing heavy crops of a flavor and keeping quality far in excess of those in the surrounding neighborhood. Moreover, he never needed to use poison sprays because he was not troubled with insect or fungus diseases.

Africa has provided many indications in recent years. In a foreword which Lord Bledisloe contributed to the pamphlet on this subject (referred to in Chapter IV) he records 'the amazing justification' of the Indore process of humus manufacture which met his eye 'in every direction' when he visited south Central Africa in 1938 as Chairman of the Rhodesian Nyasaland Royal Commission. 'There I found,' he says, 'on the one hand, vast areas of desiccated and exhausted land, utterly destitute of humus, which provided sustenance for neither man nor beast and where disease was rampant

among the native tribes, and on the other hand, in striking contrast, bumper crops of tea, coffee, cotton, tobacco and maize being harvested by natives who were relatively healthy, the secret being the use of compost, made (generally by the Indore system) out of decayed vegetation associated with animal and human residues.

'The fact that the discoveries of McCarrison indicated that immunity from degenerative human disease followed the ingestion of a fresh, well-balanced diet of unprocessed natural foods, and that those of Howard disclosed a marked similar resistance capacity, to both degenerative and infectious maladies, as a consequence of returning to the soil a sufficiency of carefully prepared waste products may be regarded as something other than a coincidence. In the latter case both crops and livestock showed this salutary immunity.'

From Rhodesia Captain Timson reports 'that the resistance of maize to the attack of witchweed, a flowering semi-parasitic plant, was raised to a point approaching immunity by manuring with Indore compost.'

This result was confirmed by Captain Mobray of Chipoli who also records (1942) that in an exceptionally dry season (only two inches of rain fell between the end of January and middle of March) the pollen on the maize 'just dried up' nevertheless 'lands throughout the colony that were well composted stood up well and gave good results. The government', he states, 'are now appealing to everyone to make as much compost as possible.' Another 'outstanding fact' has been the seed production from composted sunn hemp as compared with that where no compost had been added. This seed crop, he reports as being very bad throughout the colony, the average yield being only about one bag per acre, but 'notwithstanding bad rain conditions' his own composted crop yielded three bags an acre. He gives it as his considered opinion that it is not really profitable to grow sunn hemp for seed without the addition of compost.

Coming nearer home, the effect of organic manuring on quality in vegetable growing can be seen on a large scale on Mr. Secret's farm at Walton-on-Thames. 'Mr. Secret uses practically no artificials and raises his produce on fermented stable manure. He stands at the head of his profession as regards quality.' (Howard.)

Lord Lymington has made an interesting contribution to this question in connection with keeping quality. Wheat straw is used for thatching many of the cottages on his Hampshire estate. By keeping careful records over a number of years he found that, although the crops in question were grown side by side on the same type of soil, thatch made with straw from wheat grown with humus lasted twice as long as that grown with artificials.

One of the most impressive examples of large scale humus farming in this country is to be found at Surfleet near Spalding in Lincolnshire, on the Iceni Estate belonging to Captain R. G. M. Wilson. This particular farm, consisting of nearly 300 acres, is part of a 7,000 acre enterprise which is so many-sided in its scope, and so valuable in the lessons it provides, both in good husbandry, and in the field of education and corporate social endeavour, that to do it even partial justice would require at least a chapter. Since Captain Wilson is, I believe, at present engaged in writing a book describing his work and the idea behind it, I shall make no attempt to give any account of it here, but in connection with the special subject matter of this chapter, I must record an interesting result which he has noted in connection with the use of compost on glass-house tomatoes. This case is of interest because it is an example of the beneficent effect of compost on a non-mycorrhiza former. When he first started growing tomatoes on a large scale, Captain Wilson tells me he was much troubled by that uneven ripening of the fruit which is such a frequent cause of loss to commercial growers of this crop. He first tried the treatments advocated by expert consultants without any very marked success. Then he adopted his humus methods and this trouble disappeared; moreover he has now grown a crop of tomatoes in his houses for eight consecutive years without changing or sterilizing the soil and, so far, can detect no falling off in yield or quality. This is usually considered by experts to be impossible.

The high quality of the Iceni produce is famous wherever it is known, and Captain Wilson has demonstrated very clearly that quality, even to-day, has a very definite commercial value. This is often contested by the users of chemical fertilizers who argue that successful competition under modern marketing conditions involves putting quantity before quality. Recently during one of the periodical bad slumps in the demand for cabbages, brought about by

a seasonal glut of that vegetable, Captain Wilson sent a van load of cabbages to the market of a town in the Midlands. When the name on his van was spotted, it was quickly surrounded by buyers, and the whole load was easily disposed of. Afterwards, rather than return empty, the van loaded up with the unsaleable cabbages sent, on the same day to the same market, by other growers. These were taken back to Surfleet and added to the compost heaps.

Plant pathologists when visiting Surfleet have jokingly called it 'a most uninteresting place', because it is, as they put it, 'so boringly healthy'. If the primary cause of disease in plants (as in man) is faulty nutrition, then Captain Wilson can claim that his organic treatment supplies his crops with a balanced diet.

Grow Better Food

G. C. DYMOND

From HOME AND COUNTRY, Official organ of the Federation of the Women's Institutes — Natal, Zululand, East Griyualand And Pondoland — April, 1943.

IN the book, *Men and the Fields* by Adrian Bell, the author relates his meeting with a man of over seventy, who was cutting up a fallen tree. During the discussion that followed, the old wood-cutter spoke of the conditions under which the men of his father's generation had worked.

"Well, they had their life," he said. "Mind you, I couldn't work to-day like they worked —not if I was young, I couldn't work like I worked as a young man. The bread to-day hasn't got the STAY IN IT.

"I know because I've worked on it. When I used to go to work, and we baked at home, when I'd had my breakfast that'd stay by me to dinner time. But when we took baker's bread, why, after you'd worked for an hour, that'd be gone, and you'd feel faint inside.

"If people," he went on, "ate more of what's grown with MUCK, there'd not be half the illness about. People say that what's grown with artificial manure, does you as much good as what's grown with muck. But I know that's wrong. What's grown with chemicals may look alright, but it ain't got the STAY IN IT."

MUCK! To-day we call it Compost—or muck with a difference.

Long ages ago the earth's surface was largely covered by vast forests. The roots absorbed the essential phosphates, potash and other salts from the soil, and the sap took them to the growing leaves hundreds of feet above the ground. Under the action of the sun's rays, the green chlorophyll performed its miracles of manufacturing the numerous complex carbon compounds of the plant world.

In time the leaves withered and dropped, carpeting the forest floor as they do to-day in the forests that are left to us. Then commences the second great cycle in the Wheel of Life—Decay. Myriads of micro-organisms begin breaking down the complex products of growth into a number of simpler compounds, which are known under the collective name of HUMUS. Dig down in the forest bed and you will find the effects of this progressive action. Underneath lies that fine good-smelling earth, so prized by gardeners—Nature's compost.

During the comparatively few centuries of our vaunted Western Civilization, we have raped the land of the accumulated deposits of centuries. Forests have been cut down to make way for the fields of food plants, with which to feed the ever-increasing populations.

At first all went well, then yields dropped as the forest reserves became depleted. Artificial manures were discovered, and a new cycle of soil exhaustion commenced, and with it came plant diseases, and malnutrition of the poor, who live on simple things.

Only a few years ago, Sir Albert Howard startled the world with his frank and fearless exposition of where we are drifting. His whole work may be crystallized into these few words: The forest bed of centuries has gone—bring it back by copying it. That is what

we do when we make compost.

In the pre-war days, with the exception of a few enthusiasts, the established methods of cheap artificials with quick returns and to hell with the future, persisted. Then came the war.

"War," it has been said, "never solved anything." The effects of war may, however, enforce action—action through necessity. This war is enforcing the manufacture of compost through necessity, to make up for the diminishing quantities of artificial fertilizers available.

In pre-war days the Union's (Africa) normal consumption of all kinds of fertilizers, was approximately 360,000 tons. In 1941 it dropped to 280,000 tons and is progressively dropping year by year. This is mainly due to the occupation of Holland by the Axis, and the resulting loss of her large Superphosphate and Phosphate mixed fertilizer trade.

On the other side of the picture, we find that there has been a tremendously increased demand for fertilizers, owing to the campaign for increased food production, the higher prices for farm products and the lower prices of fertilizers, resulting from the State Subsidy Scheme of £1 per ton on fertilizers purchased by farmers.

The supply, however, cannot meet the demand, even of our normal requirements, with the result that the farmers, backed by Government interest and support, are investigating the potential value of their "muck heaps". To-day the Union is becoming more and more compost minded, with incalculable results in the resulting health of the people. How can we, the holders of small plots and gardens, help in this campaign of growing better food?

It is simple and easy.

Set aside some unobtrusive, protected corner of your garden, and make a heap of all the refuse—banana peels, old rags and bills, weeds, dead leaves and prunings, maize application forms, in fact any useless by-product of a home and garden, with the exception of bottles and relics of pre-war china, etc.

When you have collected a goodish-sized pile, commence building another heap, the minimum size of which should be 5 ft. x 5 ft. x 4 ft. high. Any smaller size than this will result in the ratio of cooling surface to volume being too great.

On the ground level, place materials such as hedge trimmings, prunings and other coarse materials, which will act as an aerating base. With this as a floor, place about 6 inches of organic waste, followed by 2 inches of animal manure, if you have it. Night soil and urine are equally good, but such materials should be kept from exposure at the sides, so as to prevent initial fly breeding.

Now cover this layer with a good sprinkling of earth, followed by wood-ashes and a little agricultural lime, if available.

Repeat this layering until the heap is about 4 feet high. It will sink later. The final layer of manure should be about 4 inches with a final good covering of earth.

If all this appears too complicated, or if all these materials are not available, then simply layer the organic wastes with a little earth. In time the materials will disintegrate and turn into a fairly good kind of humus.

As the heap is being constructed, wet each series of layers with a watering can, but never apply so much water that it runs out at the bottom. This water must be supplemented periodically, as the heap tends to dry out. To do this, make a number of holes with a crowbar or suitable stick, and pour just sufficient water into each hole.

In a few days, fermentation sets in, and the temperature rises to about 150 degrees F. and persists for about three weeks. Under such conditions it is easy to understand that all ordinary fly larvae and maggots, together with pathogenic bacteria, are destroyed.

The medical testimony of other countries is emphatic on this point. This is what J. W. Scharff, Chief Health Officer, Singapore, says in the *British Medical Association Journal* (J. Malaya Branch, 4, No. 1, 1940), under the heading, "The Safe Conversion of Village Refuse and Night Soil into a Valuable Manure."

"I am prepared to prophesy that composting of refuse in our villages, Kampongs and estates will cause a revolution in the sanitary organization of our rural areas."

The article goes on to describe how the temperatures of the heaps ranged between 168 degrees and 142 degrees F. for a period of three weeks, as compared with a temperature of 140 degrees which was found "adequate to destroy all pathogenic organisms in Municipal sludge in HALF AN HOUR.

Such an authoritative statement, and there are a number of others, conclusively disproves the fear expressed in some quarters that an increased use of composts, particularly from night soil, would

lead to an increase in amoebic dysentery and allied diseases.

The plain fact is that provided the process is carried out scientifically, the incidence of such diseases would materially decrease, with consequent improvement in general health and nutrition.

There are at present a number of municipal plants in the active process of composting night soils and town refuse. Ficksburg, in the Free State, is the centre of Government experimentation. Volksrust is making 900 tons of compost per annum from this source. Some of the schemes are good, very good; a few are bad, very bad. But in the end, the £8,-500,000 worth of fertilizer values, which at present "go down the drain" will be saved, together with the future fertility of the arable lands of the Union.

This colossal figure was calculated in terms of standard unit values, but in attempting to estimate "compost values," it is now known that such estimates should be multiplied by about 2½!

But to return to our compost heap, which has been slowly disintegrating for the last 3 or 4 weeks. The time has arrived for the first turn. The object of this is two-fold, firstly to aerate the whole heap, and secondly to bring all the outside materials, which have not been subjected to the heat of the fermentation process, into the inside of the heap.

The temperature, which will fall towards the first three weeks, again rises. Within ten days of the first turn, the material starts to crumble and darken. Bacteria, in place of fungi, now take a leading share in the process, and aeration becomes less important.

Two months after the heap was originally made, it is turned for a second time. Again the outside is brought to the inside. In three months the material is ready for application to the land. It consists of a finely divided product of which about 80 per cent. will pass through a sieve of six meshes to the inch.

There are no hard and fast rules about protection from excessive rain and wind. Just common sense, for the heap has life and must be looked after like all living things. Choose a sheltered site, where possible, protected by walls or hedges. Air, in the early stages and water are the essentials. Old Mother Nature will do the rest. Once started, your garden, together with the refuse from your home, will fertilize itself; the soil will become increasingly fertile and your garden crops will have more STAY IN THEM.

These are proven facts. At Marden Park in Surrey in 1939, the following results from feeding trials were obtained. "Poultry, pigs, horses and dairy cows were fed separately on a grain ration raised from fertile soil and compared with a similar one purchased in the open market. In all cases the results were similar. The animals not only throve better on the grain from fertile soil, but they needed less—a saving of about 15 per cent. was obtained."

"Resistance to disease markedly increased. The infantile mortality in poultry fell from 40 per cent. to 4 per cent. In pigs, troubles like scoré disappeared. Mares and cows showed none of the troubles which often occur at birth." (*Gardeners' Chronicle*, April 11, 1942).

This is what J. P. J. van Vuren, Extension Officer at Ficksburg, wrote in November, 1942:

"For many years now South Africa has been pouring the fertility of her soil into the cities. Every day thousands of tons of farm products in the form of meat, eggs, maize, wheat, vegetables, fruit and other products, are sent from the farms to feed the urban population of the country, but not the slightest effort is ever made to restore any part of all this to the soil which has been responsible for the production of these articles. In the cities, the major portion of this potential fertility goes up in smoke, or disappears down the drains, instead of being converted into useful fertilizers, and restored to the impoverished soil. It is not surprising, therefore, that in spite of the short period during which agriculture has been practised in this country, our soils are already beginning to reveal the harmful results of this malpractice, which has not only resulted in the deterioration of our soils, but is already beginning to affect the health of our community. The health of a nation can be maintained only if wholesome food, produced on sound fertile soil, is available."

Four years ago, I planted a line of Uba cane in my garden. It had about 50 per cent. of the Streak Disease, which is partly the cause of its gradual disappearance from the cane fields of Natal. I fed the shallow soil with underlying shale, with compost.

For the first two years the incidence of the disease remained the same. I cut it down each year, and after the second year, gave the line a fresh

dressing of compost. After three years there was less than 30 per cent. infection, and *this year, there is none.* Compost has cured a virus of disease in sugar cane.

This is a highly important experiment, which when confirmed by other experimenters, must lead to the establishment of properly composted seed beds, in which we can grow the varieties best suited to our climate and with little fear of the variety "running out".

The campaign for growing better food is one in which many can help. Dig for Victory in War-time, but compost for the future, the future health of the people of South Africa.

Dear Mr. Rodale:

My attention was caught by your article "Down With the Plow" reprinted from Time Magazine, page 21, Sept., 1943 —Organic Gardening. I was caught by your statement on page 22 when you say "It does not pay to get too excited about something new unless it has a background of practical results."

Because I am in agreement with you in this statement I am taking the liberty to enclose herewith some remarks about the book PLOWMAN'S FOLLY. As an answer to the belief that the plow has not had attention in scientific thinking, we are sending you, under separate cover, two numbers of the magazine BETTER CROPS WITH PLANT FOOD. In these two nubers you will find two articles entitled WHY DO FARMERS PLOW? These are an attempt to give some scientific basis for the practice of using the plow which farmers have known to be an able art even though they have not known the scientific reasons.

Because of your questioning of Mr. Faulkner's ideas I thought you would appreciate an attempt on my part to support your reluctance to accept these disturbances.

Sincerely yours,
Wm. A. Albrecht, Chairman
Department of Soils
University of Missouri.

Is It Correct To Plow?

By Prof. Wm. A. Albrecht,

Chairman Dept. of Soils—University of Missouri.

IN "Plowman's Folly" published by the University of Oklahoma Press, Edward H. Faulkner advances ideas so astonishing that the little book is sure to receive considerable attention. Polite reviewers will call it stimulating and the less well informed may even term it a bold step toward newer understanding.

If all of Mr. Faulkner's premises were true and his reasoning without fault his book would be big news, yet the most sensational feature of the work is the nonchalance with which he sweeps aside the accumulation of years of scientific research and farmer experience while staking his reputation on meager personal experience with a few crops grown in a backyard garden.

Proceeding from the common knowledge that excessive use of the plow has accelerated erosion of the soil, Mr. Faulkner reasons that the implement is altogether destructive. He makes it the scapegoat for all the plowman's mistakes in soil management, and for the effects of his honest utilization of the elements stored within the soil for man's appropriation.

This same manner of reasoning characterizes many of Mr. Faulkner's arguments. For example, he says: "The moldboard plow has been shown to be the villain in the world's agricultural drama" and only a bit earlier there is the claim that "the plow had saved humanity almost literally." In what has a more scientific flavor he says: "Most of the dissolved plant food that escapes down streams originates from decaying material plowed in." Such reasoning would argue that there was little leaching until man began to plow. It would make the saltiness of the sea a modern event.

Capillary movement of water within the soil is held up as a great force in plant nourishment. It is the central "scientific" theme given repeated emphasis. This occurs despite the admitted suggestion to the author in 1937 by his "crop specialist" acquaintance of "nearly twenty years" who said: "Tests show that there

isn't much capillary movement in the soil as we believed existed — it's really unimportant in many cases." Water and temperature are considered the main factors in plant growth. They are held responsible for variations in plants within a restricted locality.

There is an enthusiasm about turning under organic matter merely grown (or allowed to grow of its own accord) in place without the additions of manure, lime, or other fertilizers. It takes no cognizance of differences in vegetation, either in kind or quality. Weeds or forest trees as ancient as the sequoias are taken on a par with legumes as soil rejuvenating agencies. There is cited "every wooded country a perfect example of soil maintenance" with no mention of the low level of fertility and difficulty in nourishment of life involved. The soils where such widely different plants dominate and drop back in decay are not different according to the contention that the plow is wholly responsible for the low productivity of the land.

Animal life in abundance on the western plains is cited in the belief that its prevalence was due to the absence of plowing. There is omitted the historic event of declaring a thanksgiving holiday along with the discovery of a few turkeys in the unplowed wooded areas of our eastern coast.

Such differences in the kinds and concentrations of both plant and animal life in accordance with natural differences in soil fertility (other than water and temperature) are disregarded though prevalent long before the plow was known. They stand up prominently in the reader's mind as refutations of the claim that "Principles which are valid in the forest are valid in the field."

Intent on arraigning the plow, which inverts completely the upper portion of the soil profile, but on advising the use of the disk-harrow, which carried out a similar process differing only in degree, the author gives many pseudo-scientific claims centered about water and temperature for "the debacle into which our American agriculture has drifted."

The indictment of the plow by the book "Plowman's Folly" will not stand against the facts of science nor the judgment of experienced farmers. This publication will fall far short of bringing us to "realize that the Garden of Eden, almost literally, lies under our feet almost anywhere on earth we care to step" provided we allow vegetation to grow and we cling to the disk harrow as a means of turning it under rather than to the mold-board plow.

Along the same lines the following review of Mr. Faulkner's book, in the Decentralist, a magazine issued by the School of Living at Suffern, N. Y., questions the "No plow theory:"

Is It Folly To Plow?

PLOWMAN'S FOLLY, by Edward Faulkner, University of Oklahoma Press, Norman, Okla., 161 pp., $2.00.

SELDOM has a volume on agriculture received such widespread press comment as has this revolutionary book which presents the author's case against the revered plow and clean tillage and for the disc harrow and a trashy surface soil. The heart of this book is the message of current trends to organic farming, i.e., look to nature and her methods if you want to learn how to care for the soil.

Faulkner's case against the plow, in which he explains the facts of soil chemistry in terms laymen can understand, has already been made in leading papers and journals in recent weeks.

While agreeing with Faulkner's thesis, Dr. Ehrenfried Pfeiffer in a discussion at the School of Living, expressed skepticism about getting rid of weeds effectively without the use of the plow. One wonders why the author refrained from mentioning the sub-soiler and other implements designed to cut the soil deeply without turning it. There are progressive farmers who are using the disc harrow with the sub-soiler to great advantage.

The favorable reception given to this work by the U. S. Department of Agriculture and recognized agricultural experts seems extraordinary in view of the revolutionary nature of the book. Though supported by considerably more scientific evidence of the soundest long-range type, organic farming methods as advanced by Ehrenfried Pfeiffer in United States and Sir Albert Howard in England have been much slower to receive the approval of men in high places.

Organic Manures In Mauritius

G. C. DYMOND

COMPOSTING is laborious, costly and primitive. Artificials are very costly, simple of application, and a gamble. The effect of the first is long-term, the effects of the latter are to be found in a million conflicting reports. It is probable, in my opinion, that they would not be so conflicting if their use were based, as in Mauritius, on a basic policy of organic composted manures.

One of the reasons against the more popular development of composting, is the costly and laborious routine of turning the heaps. *This, I have found, can be obviated by the use of a crowbar,* which not only can be made to provide the necessary aeration during the first two months, but enables the minimum quantity of water to be used effectively. In this way, the heaps can be protected by adequate coverings of earth, or other suitable material, without excessive heat or moisture loss.

Owing to the war and the consequent lack and high price of artificials, interest in composts has increased, though practice in this country will doubtless wait upon the blessing of the Experiment Station.

The subject has, however, been very well reviewed in the November issue of the International Sugar Journal. This is the concluding paragraph:—

"It is no longer sufficient to consider it (soil fertility) in its purely physical and chemical aspects, a problem of soil texture in which the role assigned to humus is the simple one of affecting texture, or of amounts of available plant-food, particularly nitrogen, phosphorus and potash. Humus undoubtedly plays a far more subtle role, the details of which have yet to be worked out. In a recent paper R. J. Borden writes: 'It is quite apparent from the data presented herein that soil fertility includes something else besides N, P and K. It is our feeling that this "something else" is largely the relationship between the soil organic matter and its rate of decomposition. ... Its (organic matter) rate of decomposition will be governed by the number and kind of micro-organisms.'"

Reader's Correspondence

Oct. 26, 1943.

Dear Mr. Rodale:

Earwigs are a plague in this part of the country. Have you any suggestions for dealing with them? The State Agricultural Bureau prepares an "EARWIG BAIT" which is sold at a nominal fee in order to encourage gardeners to check the earwigs. This bait looks like sawdust mixed with something brown and is said to be very poisonous. Do you know anything about it? Do you know if it affects the soil?

Sincerely yours,
Ade Bethune,
Newport, R. I.

Answer

Dear Miss Bethune:

The handling of earwigs represents the same problem as that of any other type of destructive organism in the soil. By putting poisons in the soil you are accentuating the very condition that brought about the earwigs.

If your soil is full of organic material and if the biological life of the soil is encouraged, you will never have to worry about destructive insects.

I never would want to eat vegetables grown in a soil in which a poisonous substance had been placed.

We had a potato crop on our farm this year with plenty of compost in the soil and there were practically no potato bugs. We did not have to spray any poisons.

Gentlemen:

Started my compost July 1st and final turn Sept. 10th, and found your method very satisfactory, as it was very fine and full of life. After the final turn covered pile with burlap and building papers.

As my tenant garden requires some change in grades where I expect to make the compost, can I without too much loss in valuable plant food, carry the compost over until spring, if I give it more protection? Would you recommend starting a compost after

Oct. 20, or rather piling up leaves, etc. and starting as soon as frost leaves the ground?

During the forty years I was engaged in the nursery and landscape work, the value of compost was appreciated by the old school of nurserymen. Then animal manures and green crops were ploughed under prior to planting, there were no plant diseases or insects to bother healthy plant life coming from a natural food. Transplanting losses were low, compared to the high blood pressure plants of today.

Sixteen years ago we purchased our present home, the rear of lot is 20 ft. higher than sidewalk. The rear was yellow sandy clay with one to two inches of loam. Most of this loam was lost in building terraces.

With the use of compost we now have 10 to 12 inches of good loam, which is producing good vegetables for a shady garden, with an absence of plant diseases and very few pests.

Only one year was any chemical fertilizer used, as I used only my compost plus sheep or cow manure on my farm, some bone and wood ashes. Lime only as needed.

You are doing a good work in trying to awake America to the disaster that lies ahead if we do not correct our agricultural methods.

Yours sincerely.
W. W. McCartney.
New Haven, Conn.

Answer

Dear Mr. McCartney:

It is quite a common practice to hold compost over to the spring, but it should be protected as much as possible. This may be done by either canvas, burlap or a heavy mulch of straw. It should not be at a place where rains and snows will run under the heap and carry off valuable nutrients.

Compost heaps can be made all winter long but they should not be turned during the winter because the action will not start until spring.

Dear Mr. Rodale:

I am writing this because of the article on sprouting oats for chickens in the July issue and the soybean sprout article in Aug. Why not combine these two and make a completely balanced feed for chickens? What percentage of soybean would you suggest be added?

I expect to put the sprouting oats and angleworm feeding to a thorough test next spring as we are moving to a farm in Oregon.

Sincerely,
Geo. W. English.
Eureka, Calif.

Answer

Dear Mr. English:

Your idea is a good one. Regarding the percentage of oats to soybeans, it depends on what other feeds are used daily. Would suggest that you put this question to your county agent or some poultry magazine.

Gentlemen:

You recommend wood ashes and lime to use in compost, but not coal ashes. I have used hard coal ashes for many years and believe they were beneficial. I do not think they should be used in compost. There is a *difference* between hard coal ashes and soft coal ashes. What the railroads dump along their tracks are soft coal ashes. I think the writer of enclosed clipping is right, except that he recommends too much. It would not be practical to spread six or eight inches of ashes at one time on any soil.

E. S. Kunsman,
Hellertown, Pa.

Answer

Dear Mr. Kunsman:

Regarding the use of ashes, there are strong sulfites which remain in the ashes and anyone who loves the soil should instead of putting in this material, buy peat moss because peat moss will aerate the soil and accomplish what ashes are supposed to accomplish without their bad effect. Of course, the effect of ashes will not be felt immediately but if they are used over a period of years, it will eventually be disadvantageous.

There is probably only a slight difference between hard or soft coal ashes.

Gentlemen:

I have a small garden and had a wonderful yield of tomatoes this year, but due to lack of space will have to plant them in the same location next year. If I use compost and bone meal, will the ground be reconditioned enough to give me good results next year, if I

plant tomatoes in the same location?

Mrs. H. W. Camadine.
Albany, N. Y.

Answer

Dear Mrs. Camadine:

Replying to your inquiry regarding the place to plant tomatoes in your garden, it is always best to rotate crops, but the lack of rotation is not as serious where a great deal of compost is used. If you can put sufficient compost in the ground each year, you could plant tomatoes for ten years in succession in the same place without fear. However, if you do have the means of rotating the crops it is best to do so.

You mention the use of bone meal. The use of this material is the same as using raw manure without composting. It will not become effective for possibly half a year, so that if you want to use bone meal, it is always best to put it in a compost heap and let it decay with the rest of your material.

Dear Mr. Rodale:

I have a garbage disposal unit installed in the kitchen sink. The kitchen refuse now empties into the cesspool. Should I break the line and drain this refuse into a separate cesspool or pit to be emptied periodically and the contents placed into the compost pit. Would you say that this would be valuable as compost? Bones, vegetables, fruits or the peelings and cores and seeds of these are ground fine and mixed with water before passing into the drain.

Very truly yours,
Frank G. Chiles,
Bethlehem, Pa.

Answer

Dear Mr. Chiles:

I believe that the garbage masticator is the ideal thing for a preliminary break-down of the garbage, as it will hasten the decay of the material very much. No doubt, you can divert your line so that the ground refuse will deposit into a cement lined pit in the ground. You would want to have a wooden cover from the outside of this pit which you can open up from time to time and apply lime occasionally.

I would be very much interested in seeing what you do. I am sure that with your ability as a builder you will be able to design something that will be of great interest to our other readers and we would later let you explain to our readers what you have done.

The beauty of this method is also that it will work well in the cold winter days when the ground is frozen up. However, the question of the pit freezing up might have to be taken care of. Possibly the top cover of the pit would have to be underlaid with some insulating material, and perhaps the sides of the pit would have to have an air space between the concrete side and the earth.

Gentlemen:

1. I find it difficult to procure fresh manure and wish to know if there is some chemical which will perform the same process in making compost.

2. Is it possible to break down sawdust and plane shavings into compost; if so is there objection to using this material from fir wood which contains pitch; if so is there a process to rid this sawdust of the pitch?

M. M. Cecil,
Oakridge, Oregon.

Answer

Dear Mr. Cecil:

Replying to your letter of May 31st, you say you find it difficult to secure fresh manure. We do not recommend any chemicals as a substitute, as that would defeat the purpose of organic gardening. If your requirements are small, I am sure you can secure such things as sheep and cow manure in the seed and hardware stores. In such event, I would use less manure in your compost heap. In other words, where you use six inches of green material and two inches of manure, substitute only one inch of manure. In addition to the purchased manure, you could also use some kitchen wastes of animal material as well as such purchased animal material as bone meal, tankage and other organic fertilizer of animal origin which are purchasable through fertilizer companies.

Dr. Pfeiffer furnished the following information regarding sawdust and pitch:

The use of sawdust is all-right in compost heaps, if mixed with other materials. The more moist the green and other materials are the better. Pitch of course will slow down fermentation. It may be wise to use the pitch containing sawdust only after it has been rotting in the open aid during the summer so that the pitch has had a chance to disintegrate. This

kind of sawdust should only be interlayered in Compost heaps in layers not exceeding 2 inches of thickness. Another way of sawdust composting is to interlayer it as described and pour plenty of liquid manure on those heaps. The best experience we had with sawdust was as litter in cow and horse barns, where plenty of liquid manure penetrates it. Then a very fine humus results. In general deciduous trees provide a more suitable sawdust than conifers for humus production.

My Dear Sir:

Thank you kindly for your letter of Aug. 25th in answer to my question. You mention each fall a dressing of *purchased peat humus* ground very fine that will absorb easily into the soil.

I have tried several large distributors of peat moss, but no one seems to know what peat humus is. All they have is the regular coarse peat moss that comes packed very solid in a ball.

I can see your point and I believe it would help eventually to put ground in condition. Will it eventually harm and reverse the condition by getting the soil too loose or spongy by using this each fall, continuously?

The big question is where to get this purchased peat humus?

A. G. Dabbert,
Park Ridge, Ill.

Answer

Dear Mr. Dabbert:

Replying to your letter of September 21st, peat humus and peat moss are not the same thing. The peat humus contains fertilizer value, whereas peat moss is merely a filler, giving the soil structure and enabling it to retain moisture. It helps in aerating the soil.

Naturally. if you put too much of the peat moss into the soil, you might reach a point where it would interfere with the growing of plants. On the other hand, peat humus, which contains much organic material, can be used plentifully and there is practically no danger of overusing because in our experiments, we have actually grown plants in pure compost.

Gentlemen:

Would you recommend a sawdust mulch around shrubbery and around rose bushes, and if so, when would you suggest that the sawdust mulch should be applied—before the ground freezes or after?

Would you recommend mixing cow manure and poultry manure in layers with leaves and grass, etc. in a flat heap or pile and let lay until spring and would you recommend using some lime and sawdust in the layers?

William H. Mantz,
Irvington, N. J.

Answer

Dear Mr. Mantz:

Inasmuch as roses are not an acid-loving plant, it would not be advisable to use a sawdust mulch because sawdust is somewhat acid. It would be satisfactory to use compost if you have some. If you have a supply of sawdust and would mix it with lime, putting about 5 per cent by volume of lime in it, and thoroughly mixing it, it may be alright, although it would be much better if the sawdust was decayed first in a compost heap along with some animal matter. Many sewage systems of various cities have a

(Continued on page 31)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Organic Gardening published monthly at Emmaus, Pennsylvania for October 1st, 1943.

State of Pennsylvania
County of Lehigh

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Jerome I. Rodale, who having been duly sworn according to law, deposes and says that he is the Business Manager of the Organic Gardening, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Rodale Press
Publisher Jerome I. Rodale and Joseph Rodale t-a 6th and Minor Sts., Emmaus, Penna. Editor Jerome I. Rodale, Emmaus, Penna. Managing Editor, Jerome I. Rodale, Emmaus, Penna. Business Manager, Jerome I. Rodale, Emmaus, Penna.

2. That the owners are: Jerome I. Rodale and Joseph Rodale, trading as RODALE PRESS. 6th and Minor Streets, Emmaus, Pennsylvania.

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

Jerome I. Rodale

Sworn to and subscribed before me this 25th day of October, 1943.

Elmer A. Barto, Notary Public.

by-product called sludge which we do not recommend for food crops, but which would be very fine for applying around trees, rose bushes and the like. These mulches should be applied before the ground freezes.

It is always best if various kinds of manure are mixed. Cow manure and horse manure mixed is better than either one alone and the same thing applies to poultry manure. You should have our book called "Compost And How To Make It" which sells for 50 cents, which describes how to make a compost heap.

Gentlemen:

This subject of mulching interests me very much, Mr. Rodale. A fine brochure you have.

About the middle of July this year we transplanted some Rhodedendrons and gave no water to them at all. We did mulch with 2 or 3 inches of sawdust. A week went by and each of the fifteen plants were as "perky" as could be and examination showed the soil under the mulch to be damp. Now you know how dry the late summer and early fall has been around here so this seems important as a practice.

You ask for suggestions of where soil can be obtained for compost making:

Every farm has lanes or roads that should be passable the year round. Yet these permanent features are rarely constructed to serve as such. When needing soil I have excavated sections of our roads and obtained all the soil I needed. Then too here is a place to put unwanted stones and rakings and last, coal ashes (minus the nails of course). One nice feature in this regard is: one can do this double action as and when he desires. As I think of my farm I can see where load after load of soil can come from, for years to come. As the farm has its roads and lanes so the small property has its footpaths and short cuts.

Why I refer to the March 43 issue is because of the article "Orchard Mulching" by J. K. Shaw.

Robert Ross,
Cresco, Pa.

A. P. Draper of Lebanon sends in $3.00 for a renewal of his subscription to Organic Gardening. Accompanying his check is the remark, "I like your wormy little magazine."

Gentlemen:

When I came into my office this morning I found a four page folder on my desk, a part of which I am enclosing with this letter and three dollars for a one year subscription to your publication, ORGANIC GARDENING.

My wife and I own two farms in Miami County, each of 100 acres, and as a boy living with my parents fifty years ago, occupied one of the farms that we now own and at that time this land was considered as good as the best in the Miami valley, and today I regret to say that they are only about 60 or 65 per cent as productive as they were fifty years ago, although we apply between five and six hundred loads of barnyard manure on them each year. In connection with the manure it costs about four hundred and fifty dollars each year for commercial fertilizer to keep our production where it is and to be assured of grass

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COMPOST—And How To Make It

A phamphlet of 64 pages answering many questions about the best way to make compost. This book consists of material that has appeared in Organic Gardening from time to time.

Organic Gardening
Emmaus, Pa.

and clover crops following our wheat. Clover, both red and sweet, are always plowed under for corn and some other crops.

I hope to obtain some valuable information from this subscription and I assure you that I shall enjoy reading your theory of soil fertilization.

Yours for better health through better farm and garden products.

O. I. Davis,
Troy, Ohio.

Answer

Dear Mr. Davis:

Welcome to our happy family of organic gardeners and farmers! Your letter sounds as if you are progressive and I am sure that you are going to put the organic method into practice.

Many farmers state that making compost heaps is too costly; but when you figure that you save the cost of chemical fertilizers, and that after a few years your returns will be so much greater, that as soon as the labor situation warrants it, it would be a fine thing for you to convert your farm to the organic basis.

However, we urge caution and as a rule suggest that this method be started with only part of your farm, and then gradually extend it to the whole. Kimberton Farms, located at Kimberton, Pa., which is over 500 acres in extent, has been using the organic basis exclusively now for about two years.

Dear Mr. Rodale:

Would like you to answer a few questions: I have been reading "Bio-Dynamic Farming and Gardening," by Dr. E. Pfeiffer. It seems to differ with your statements. In the fact that they recommend preparations to use on composts, land and plants. Also trees.

Are these compounds numbered 500 to 508 of any value? Do you know how to make them? Can you tell me of one who does and will tell me? Would it be of any value to me to attend the Kimberton Agriculture School, this winter, if I can find time? I am pretty well all read up on all subjects about farming. I have had a long experience. Also have had available some real experience of men 75 years old. They farmed with their father's and grandfathers on Organic Soils that were made by nature.

I am a pretty good farmer. I have the prize patch of Pole Lima Beans, anyone ever saw. All say this is true that see it. Less than 600 poles. We have picked 60 bushels of beans to date and there is 20 bushels on the vines ready to fill. Blossoms and little beans still coming. If I get a little moisture and a late frost I believe we will pick 100 bushels. Beat this if you can.

Why is it not in line with straight Organic Farming to use raw ground phosphates and potash in your compost? They are an earth the same as lime and so is Nitra of Soda.

Why wouldn't yeasts help compost decompose? Molds will, I am sure. Why wouldn't "Cylopes Larva" be a good thing to add to compost? Also Daphnia?

Can you tell me just what Kelp Ore is like? As South Jersey has been under the ocean several times do you think we can find any here? See book: "Friend Earthworm" by Dr. Oliver.

I sure am going to send you some business for your "Maga-

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Gentlemen:
Enclosed is $3.00 for one year subscription (12 issues) to Organic Gardening.
NAME .....
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zine" as soon as farm work is cleaned up and cold weather comes on.

About "Honey Locusts," how much feed do you figure they will yield to an acre when grown?

Claude N. Terry,
Millville, N. J.

Answer

Dear Mr. Terry:

We, ourselves, do not practice the Bio-dynamic method of farming, so we cannot tell you anything about the sprays or other material that they recommend.

I am sure that you would get some value out of the Kimberton Agricultural School Course if you could find the time. This teaches the bio-dynamic method. In that case you could decide whether you want to follow their method. It is not wrong to use raw ground phosphates; in fact, we recommend it, but we do not recommend potash or nitrate of soda. Lime is satisfactory to use.

The theory of making compost has not reached perfection by a long shot and we feel that in the years to come, there may be many suggestions that will be used to help make better compost, quicker compost and compost with less labor. I, personally, have come to the conclusion at the present time that the right kind of natural bacteria would help a great deal and we are experimenting with them. Perhaps yeasts and molds would help, but someone would have to do the experimenting. The point is, however, that the process must be kept simple or it will not be practical except in individual cases.

I am sorry that I do not seem to find any record of Kelp Ore. From the name, it would appear that it has something to do with seaweed and if so, it ought to be very valuable.

Regarding your inquiry as to Honey Locusts, we have checked up and found that a minimum yield would be about 20 bushels per tree. You can figure out about how many trees to an acre.

Gentlemen:

The comments in your advertisements are interesting, but I do not see the excuse for a separate publication on organic gardening. Of course, most of your statements are true. The merits of organic materials for the garden are well known, and I use very little other. But there is the simple fact that we do not have enough organic material. Even if all was used, there still would not be enough, for much organic material must find its way down our rivers, or waste into the air.

But are you not going too far in your remarks? "These artificial fertilizers kill the earthworms . . . the soil packs hard and you wonder why your plants won't grow." Not if they are used properly. Of course, no intelligent person would use chemical fertilizers without any organic material. That is, he would not in ordinary soil culture. In the new soilless culture, it seems practical to do away with all organic material, but that is not yet an important method of culture.

As for your Howard process (I do not know which this is) or any other process, certainly no process has a monopoly on merit. I use four processes, according to the material, and there are others equally good. Some are purchased ground, like bones. Leaves are used in shallow trenches between the rows. Rough refuse is trenched. Lawn clippings and other garden trimmings are used as a mulch before turning under. Then there is a compost heap which I detest, though it gives good fertilizer.

A. W. Forbes,
Worcester, Mass.

Answer

Dear Mr. Forbes:

We disagree with you when you state that there is not enough organic material. The important part to bear in mind is that when a farm is changed over to the organic system, more material is needed at the start than later on. After six or seven years the ground is so charged with bacteria that much less compost is needed each year. This has been proven many times.

At the start it must be considered as an investment. The start of any business requires an investment which pays dividends later on.

It is not only because chemical fertilizer is used that the soil packs hard. It is due to a cycle which includes the overuse of chemical fertilizers, spraying of poisons on the ground and farming the wrong way, from an organic standpoint.

What we advocate is not merely the use of compost in the soil but a complete organic approach to the problem which takes in many other things, which we discuss in our magazine from time to time.

In using your various processes, be sure that no crops are grown in any of the material that you use before it is thoroughly decayed. That is the advantage of composting everything first.

AN AGRICULTURAL TESTAMENT

By Sir Albert Howard, C. I. E., M. A.

Formerly Director Institute of Plant Industry Indore, and Agricultural Adviser to Central India and Rajputana.

Sir Albert Howard C. I. E., M. A.

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This is the recognized standard text book for gardeners and farmers who wish to change from the use of ordinary chemical fertilizers to home-made organic fertilizers. Sir Albert Howard has forty years of active experience in the field of organic fertilizers and is the accepted leading authority on the subject.

We have arranged to print this book in the United States and have been able to reduce the price to **$3.50**

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